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## MEMORANDUM

To: Director, Native American and International Affairs  
Attn: 96-43000

Through: Bruce C. Muller, Jr.  
Acting Director, Technical Resources

From: Tony Wahl, Hydraulic Engineer  
Water Resources Research Laboratory

Subject: Trip Report — Aix-les-Bains, France — Control No. 029

1. Travel Period: April 14-22, 2007.
2. Places and/or offices visited: Aix-les-Bains, France and Grand Maison Hydroelectric Development.
3. Purpose of Trip: To participate in meetings of the European Working Group on Internal Erosion and the Dam Safety Interest Group (DSIG) of CEA Technologies, Inc.
4. Synopsis of trip: I traveled to Aix-les-Bains on Saturday and Sunday April 14-15, 2007.

On April 16-17, 2007, I attended the meeting of the European Working Group on Internal Erosion. A copy of the meeting schedule and list of participants is attached. This is the fifth meeting of this group since its organization in 2004. The final report of the working group is due to be presented this September, to the International Commission on Large Dams (ICOLD) at the European Club Dam Symposium in Freising, Germany. The working group has been pursuing research organized under eight topics: location of internal erosion, loading conditions, initiating processes, the role of filtration zones, progression of internal erosion, detection methods, intervention measures, and modeling of breaches caused by internal erosion. This meeting presented final papers on these topics and draft chapters of the group's final report. Related topics beyond the principal eight were also addressed, including the effects of frost and thaw on embankments and the estimation of breach parameters from case studies of dams failed by internal erosion. The meeting and exchange of information and ideas with European counterparts was very productive.

On April 18-19, 2007, I attended the meeting of the CEA Technologies, Inc. Dam Safety

Interest Group (DSIG). The Bureau of Reclamation's Dam Safety Program is a member of this interest group composed of electrical utilities from around the world. The meeting program and list of attendees are attached. On April 18, 2007, I presented a status report on the DSIG's dam erosion and breach modeling project for which I am the technical coordinator. My presentation focused on the completion of our phase 1 project, and the initiation of our phase 2 project, which began with a recent workshop held two weeks previously in Davis, California. This workshop marked the beginning of an extensive effort to evaluate three state-of-the-art dam breach models using data obtained from real-world case studies and large-scale laboratory tests. The evaluation will take place over the summer and fall of 2007, and will lead to the identification of modeling technologies that can be incorporated into the Hydrologic Engineering Center's River Analysis System or HEC-RAS modeling suite as well as other leading tools used to model dam-break floods. Eight organizations are actively participating in the project:

- a. Bureau of Reclamation
- b. Electricité de France (EDF)
- c. Hydro Québec
- d. École Polytechnique Montréal
- e. U.S. Army Corps of Engineers
- f. U.S. Department of Agriculture -Agricultural Research Service (USDA-ARS)  
Hydraulic Engineering Research Unit
- g. HR Wallingford (Great Britain)
- h. ELFORSK (Sweden)

In addition to these in-kind partners, there are additional CEATI-member utilities contributing cash resources to the project. The next important task in phase 2 is to identify budgetary needs of all project partners and determine which funding needs can be met with the available cash funding.

An important outcome of the phase 1 project has been the development of a database of real-world dam failure data, suitable for use in validating numerical models now under development. This work has helped identify the types of data that are often lacking in such cases. To improve the quality of case study data obtained from future dam failures, we discussed the concept of forming teams that could respond on short notice following a dam failure to collect necessary data. A first step in such a process could be the development of a written protocol for data collection following dam failure. The publication of this protocol could improve the quality of data obtained from future failures, even if no formal team was able to respond. We discussed the possibility of the partners in the present research effort developing such a protocol.

Another significant aspect of the phase 2 project, is an effort just begun, to compare the performance of different devices used to measure the erodibility of cohesive embankment materials. A Ph.D. student from France, Pierre-Louis Regazzoni, has just begun a 6-month

assignment in the U.S. (three months at Reclamation followed by three months at USDA-

ARS) to work on this project. We discussed this work and made plans for a visit to the U.S. later this summer by other French researchers involved in this study.

On Thursday, April 19, 2007, I presented an overview of a research proposal made to the DSIG six months earlier by Reclamation. The proposal concerns research on the performance of fuse plug spillway embankments in climates in which embankment breaching might be required while the embankment was frozen. Reclamation proposed to explore this topic with tests carried out in our environmental chambers and then develop a written general design guide for fuse plug spillway embankments. The DSIG is eager to undertake this work and will discuss funding arrangements with Reclamation's Dam Safety Program.

The DSIG meeting presented an opportunity for all members to make technical presentations of interesting work and issues being addressed at each utility. One of the most interesting was a presentation by Dr. F. Lempérière regarding the piano-key weir spillway control structure. This modified design of a labyrinth spillway achieves significant structural and hydraulic efficiencies, increasing the range of possible applications for labyrinth weirs.

On Friday, April 20, 2007, I accompanied other members of the DSIG on a visit to the Grand Maison Pumped-Storage Hydroelectric Development. I returned to Denver, Colorado, on Sunday, April 22, 2007.

5. Conclusions: The DSIG provides a useful forum for exchange of information with other dam owners. The DSIG is pursuing several research efforts that will be of value to Reclamation at their conclusion.
6. Actions required: None.

#### Attachments

cc: 84-44000 (Becker, Snorteland) (w/att)  
 86-43100 (Principe), 86-60000, 86-68000, 86-68560 (Pugh, Einhellig, Wahl, *Travel Report file*)  
 (w/o att to each)

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